

isolated by any of a number of standard techniques (see, e.g., Sambrook et al., "Molecular Cloning, A Laboratory Manual," 2nd Ed. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1989).

5 The invention also encompasses: (a) expression vectors that contain any of the foregoing GLUTX-related coding sequences and/or their complements (*i.e.*, "antisense" sequence) and fragments thereof; (b) expression vectors that contain any of the foregoing GLUTX-related sequences
10 operatively associated with a regulatory element (examples of which are given below) that directs the expression of the coding sequences; (c) expression vectors containing, in addition to sequences encoding a GLUTX polypeptide, nucleic acid sequences that are unrelated to nucleic acid sequences
15 encoding GLUTX, such as molecules encoding a reporter or marker; and (d) genetically engineered host cells that contain any of the foregoing expression vectors, and thereby express the nucleic acid molecules of the invention in the host cell. The regulatory elements referred to above
20 include, but are not limited to, inducible and non-inducible promoters, enhancers, operators and other elements, which are known to those skilled in the art, and which drive or otherwise regulate gene expression. Such regulatory elements include but are not limited to the cytomegalovirus
25 hCMV immediate early gene, the early or late promoters of SV40 adenovirus, the lac system, the trp system, the TAC system, the TRC system, the major operator and promoter regions of phage λ , the control regions of fd coat protein, the promoter for 3-phosphoglycerate kinase, the promoters of
30 acid phosphatase, and the promoters of the yeast α -mating factors.

Additionally, the GLUTX encoding nucleic acid molecules of the present invention can form part of a hybrid gene encoding additional polypeptide sequences, for example, sequences that function as a marker or reporter. Examples
5 of marker or reporter genes include β -lactamase, chloramphenicol acetyltransferase (CAT), adenosine deaminase (ADA), aminoglycoside phosphotransferase (neo^r , G418 r), dihydrofolate reductase (DHFR), hygromycin-B-phosphotransferase (HPH), thymidine kinase (TK), lacZ
10 (encoding β -galactosidase), and xanthine guanine phosphoribosyltransferase (XGPRT). As with many of the standard procedures associated with the practice of the invention, skilled artisans will be aware of additional useful reagents, for example, additional sequences that can
15 serve the function of a marker or reporter. Generally, a chimeric or hybrid polypeptide of the invention will include a first portion and a second portion; the first portion being a GLUTX polypeptide or a fragment thereof (preferably a biologically active fragment) and the second portion
20 being, for example, the reporter described above or an immunoglobulin constant region.

The expression systems that can be used for purposes of the invention include, but are not limited to, microorganisms such as bacteria (*e.g.*, *E. coli* and
25 *B. subtilis*) transformed with recombinant bacteriophage DNA, plasmid DNA, or cosmid DNA expression vectors containing the nucleic acid molecules of the invention; yeast (*e.g.*, *Saccharomyces* and *Pichia*) transformed with recombinant yeast expression vectors containing the nucleic acid molecules of
30 the invention (preferably containing a nucleic acid sequence encoding all or a portion of GLUTX (such as the sequence of SEQ ID NO:1); insect cell systems infected with recombinant virus expression vectors (*e.g.*, baculovirus) containing a

nucleic acid molecule of the invention; plant cell systems infected with recombinant virus expression vectors (e.g., cauliflower mosaic virus (CaMV) and tobacco mosaic virus (TMV)) or transformed with recombinant plasmid expression
5 vectors (e.g., Ti plasmid) containing GLUTX nucleotide sequences; or mammalian cell systems (e.g., COS, CHO, BHK, 293, VERO, HeLa, MDCK, WI38, and NIH 3T3 cells) harboring recombinant expression constructs containing promoters derived from the genome of mammalian cells (e.g., the
10 metallothionein promoter) or from mammalian viruses (e.g., the adenovirus late promoter and the vaccinia virus 7.5K promoter).

In bacterial systems, a number of expression vectors may be advantageously selected depending upon the use
15 intended for the gene product being expressed. For example, when a large quantity of such a protein is to be produced, e.g., for the generation of pharmaceutical compositions containing GLUTX polypeptides or for raising antibodies to those polypeptides, vectors that are capable of directing
20 the expression of high levels of fusion protein products that are readily purified may be desirable. Such vectors include, but are not limited to, the *E. coli* expression vector pUR278 (Ruther *et al.*, *EMBO J.* 2:1791, 1983), in which the coding sequence of the insert may be ligated
25 individually into the vector in frame with the lacZ coding region so that a fusion protein is produced; pIN vectors (Inouye and Inouye, *Nucleic Acids Res.* 13:3101-3109, 1985; Van Heeke and Schuster, *J. Biol. Chem.* 264:5503-5509, 1989); and the like. pGEX vectors may also be used to express
30 foreign polypeptides as fusion proteins with glutathione S-transferase (GST). In general, such fusion proteins are soluble and can easily be purified from lysed cells by adsorption to glutathione-agarose beads followed by elution